

# Achieving Proper Balance

"Arvel Gentry continues his discussion of sail adjustments on the wind"

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Last month I discussed a systematic procedure I have found useful in helping me achieve proper mainsail and genoa trim. I described how the telltale system in Photo 1 and the tuft system in Photo 2 are used to achieve a good basic trim for the two sails. But good windward performance depends not only upon basic sail trim, but also on boat balance: having just the right amount of weather helm.

Last month we saw how to use the telltales and tufts to achieve the basic sail trim settings. Once you have these settings, sail to windward with the first lee side tuft, T-1 in Photo 2, showing just a slight amount of agitation. Let the tiller go and watch the boat's movement. If the boat starts to head up slowly into the wind, the boat's balance probably is good.

If it heads off instead, you have what is called lee helm and it should be corrected before going farther. First try moving crew weight forward and to leeward in light air. If possible, lean the

mast farther aft.

If the boat turns sharply to windward when you release the tiller, then you have too much weather helm. Try moving the crew aft and to the weather side, and ease the mainsail traveler down until only a moderate amount of tiller pressure is required to keep the boat going straight. If you still have too much weather helm, try leaning the mast forward.

Once you have the boat in reasonable balance, turn your attention to the genoa. The trim of both sails might look about as they do in Photo 3. Examine the leech of the genoa and the curve of the mainsail in this picture. You will see that the distance between the genoa and the main increases from the spreader down to the boom, and the shape of the genoa leech does not follow the mainsail shape (as it should). With smooth water conditions, this is a good time for a barber haul.

To rig a barber haul, hook a line to the jib clew with a shackle, run it across to the windward winch, and pull the clew "into" the boat. As you do this, ease off on the genoa sheet to maintain the same distance off at the spreader. This easing will create more twist and camber in the sail but the fixed distance off the spreader can be maintained. The boat now should not only point closer to the wind, it also should keep up its speed. What we have done with the barber haul is to get a better method of controlling the *total* shape of the genoa.

With a barber haul, you may have to move the jib fairlead a bit forward to get the desired leech shape in the genoa. After all this is completed, check genoa telltale #3 (Photo 1). If you barber haul too much, this telltale will twirl.

As you barber haul the genoa in, you also may have to move the mainsheet traveler to windward more, and ease the mainsheet at the same time to maintain proper attached flow all up and down the mainsail. If the genoa hooks in sharply at the leech, first check the leech line. Let it out until the leech shakes, then tighten it just until the flutter stops. Also increase the jib halyard tension. This will ease the leech so that the air gets a straighter run from the sail's mid-point to the leech. Photo 4 shows the sail with the barber haul set.

When to barber haul and how much are difficult questions to answer. Basically, the barber haul should be adjusted so the leech

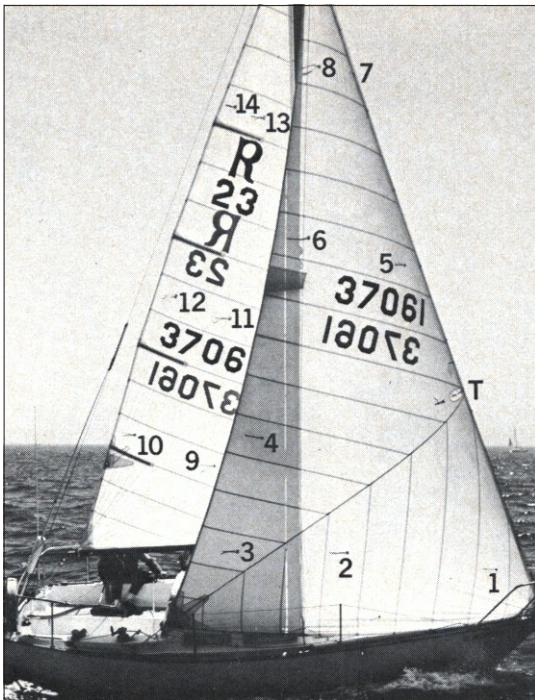


Photo 1. Telltale and tuft arrangement.

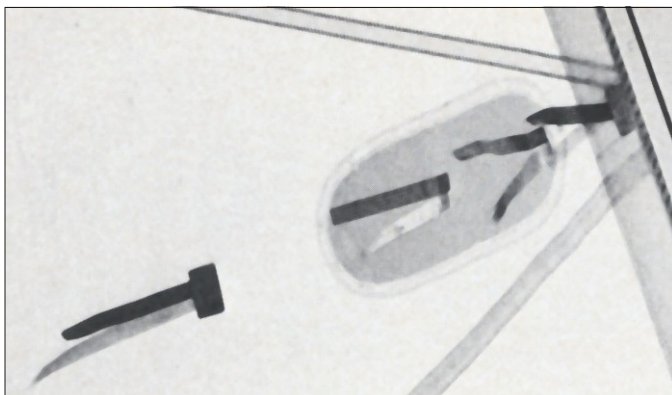


Photo 2. Tuft system.



Photo 3. Without barber haul.

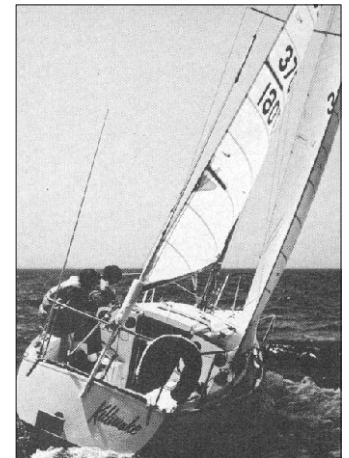


Photo 3. With barber haul.

of the genoa follows the curve of the mainsail. But there will be times when the genoa should be trimmed tighter and other times when it must be moved farther outboard. But when and how much?

One useful approach lies in the axiom "know thy boat." By this, I mean you should have a very good idea of what boat speed you should be able to achieve at different velocities of apparent wind. I call this *maximum windward speed* and it is obtained by recording apparent wind speed and boat speed readings when beating in smooth water conditions. A large collection of these data points can be plotted (boat speed versus apparent wind speed) and a smooth line drawn through the highest points. However, it is important that each point be an honest data point; that is, that the boat be sailed at the apparent wind angle and with sail trim settings that you feel give the best speed-made-good to windward. As you learn more about your boat and how to trim its sails, this maximum windward speed curve should, of course, be revised.

When the water is smooth and the boat has reached its maximum windward speed in moderate (10-12 knots) try the barber haul. But first, sail close hauled without a barber haul for a few minutes and observe the average speed. Write both the boat's speed and the average wind speed down. Now barber haul the genoa in and watch boat speed.

If boat speed does not drop, then obviously you should be barber hauled for this wind and sea condition. If the boat speed does drop, you must now determine if the closer pointing angle achieved is offsetting the speed reduction. More testing is required.

When the wind and chop increase and the boat cannot reach maximum beating speed, the barber haul will have to be eased off to get speed back up.

In light winds you need more camber in the genoa and you should ease the sheet. This, however, moves the sail farther from the spreader and the ability to point goes down. Check boat speed and slowly barber haul the clew back in to see if you can get back some pointing ability without losing too much speed. Maintaining unseparated flow on telltale #3 is going to be particularly difficult under these conditions.

At this point you should have both sails trimmed fairly well. Now check both the knotmeter and the apparent wind speed and write down the values. All further sail adjustments should be made carefully with a close watch on the knotmeter. Try changing the genoa distance off the spreader and watch boat speed and pointing ability. This is a very important parameter and careful testing is required to find the optimum distance for each wind and sea condition.

Always record exactly how the sails are set after each adjustment to sail trim. Numbering each genoa and traveler screw, marking every inch along the outhaul and similarly marking the mast for halyard tension, (the backstay as well) makes this job much easier. By using these sail trim numbers, you have a sure way of repeating your trim under similar wind and sea conditions.

After a number of practice sessions you will be able to construct a complete table of the sail settings for the complete range of wind speeds. This table should include the distance the sail should be off the spreader, the genoa track number, barber haul position, genoa halyard, outhaul, main traveler, backstay tension, mast lean position, crew weight position, tacking angle, and best boat speed. Tabulate these trim numbers for each three-to-five-knot change in apparent wind speed.

When race time comes, such a table can be taped to the bulkhead and used as a reference by the crew. Every time the apparent wind speed indicator changes, they should consult the

sail trim table and make the necessary adjustments. While this relieves the helmsman from constantly worrying about sail trim, he should, however, check the sail trim himself occasionally and suggest any necessary changes.

Never feel bound to a sail-trim chart if you think a trim change might improve speed under new sailing conditions. If you do make a change, though, have the crew make a note of it so that the trim chart can be revised. In this way, your learning from past experience will be preserved.

All this sail-trim discussion has been for moderate winds of 10 to 12 knots. In light airs you need every bit of sail drive you can get. Slack off the halyard, and the backstay if you think you need more sail camber. Also keep the genoa farther off the spreader. Exaggerate the forward location of the genoa car in light airs. Barber haul with care and watch telltale #3. If it twirls, barber haul it only if it definitely gives increased speed or pointing ability.

Never try to point too high, and always keep the boat moving. Frequently check for lee helm, and if it occurs in light winds, shift crew weight forward and to leeward. Lee helm in light airs can be very bad for you will generate excessive leeway.

All these light air comments are pretty standard, but as Steve Colgate pointed out (*SAIL*, October 1973), too much sail camber can be a bad thing in very light air. The reasons revolve around the way sail pressures change with camber, and the way boundary layer reacts to pressure and low air speeds.

In general, increased sail camber means there will be a decrease in the suction pressure from the forward part of the lee side of the sail as one moves aft (increasing pressure). In addition, the boundary layer is more prone to separation as air speed gets lower. This means that increased camber at low wind speed may give you a difficult leech separation problem. When this happens, the leech telltales on the main (10, 12, and 14 in Photo 1) and the genoa (3, 4, 6, and 8) will start to twirl.

If the telltales do twirl, the sails have too much camber. On the mainsail, tighten the outhaul, ease the sheet off a bit, and move the traveler to leeward to see if you can get the leech telltales to lie down. On the genoa, tighten up on the backstay and halyard, and move the clew outboard. Remember, a flat sail without separation usually is better than a fuller sail that has leech separation.

When the wind gets high you do have to start compromising. A tight backstay and genoa halyard are very important. Move the genoa car aft and barber haul it if maximum beating speed still can be maintained when it is hauled in. Mainsail trim in heavy winds is primarily a matter of controlling weather helm and heel angle.

First of all, trim the main very flat with the outhaul. Then let the traveler down to leeward and tighten the mainsheet. Be careful to control the leech so that it doesn't hook to windward. Take up on the cunningham tension even to the point of creating vertical folds along the luff. This tension helps keep the sail camber forward and makes the leech fall off to leeward which will ease both the weather helm and the heeling force.

Above all, have everyone, including the helmsman, to windward to keep the boat as flat as possible. If you still can't keep the boat flat it's time to reef the main. If that won't do it, reduce the size of the headsail.

Of course if you can't get either sail to trim the way you think it should, consult your sailmaker. He may be able to tell you what you are doing wrong, or he may need to rework the sail slightly to correct the problem. For example, the leech of the mainsail in Photo 3 was too tight. The sail was considerably improved by letting out two seams by 1/4" (after these photos were taken).